



Vernacular Architecture For Sustainable Hill Town Development Of Himalayas, Case Study – Dharamshala, H.P, India

Adite Dhadwal

Architect and urban planner

Abstract: Vernacular architecture is mainly known for the use of local resources and technology of the region itself. Vernacular architecture being local, always supports the natural need of the environment with very less carbon footprint making the environment of the hill town calm. But today due to rapid urbanization and a drift towards modern resources, vernacular architecture is losing its identity. This loss is activating the zones which are already highly prone to various natural disasters and making the disaster occurrence frequent. The study area for this paper- Dharamshala, H.P. India is witnessing the shift from traditional development towards modern and quick development. Due to this, the excavations are increasing therefore the disaster-prone zones of Dharamshala are getting activated. Dharamshala being in zone 5 of seismic zones, is continuously witnessing earthquakes of various magnitudes. This paper aims to focus the switch back of modern construction to vernacular architecture (earthquake resistant), to have better and safe development.

Keywords: Sustainable Hill towns, Vernacular architecture, Natural disasters, Urbanization, Vernacular materials, eco-friendly materials.

1. Introduction: Today due to vast use of industrially produced modern construction materials, their negative impact associated with their construction activities on our earth has been noticed to a great extent and this has called for the shift back to vernacular materials and architecture. Vernacular architecture using locally available materials is no newer to the society in fact it was widespread until the industrialized revolution. Industrialized revolution brought materials industrially produced at very less price and with easy and quick construction methodology. This no doubt gave a push to a universally adopted architecture which is dependent on energy consumption [2]. But due to this overcrowding of industrially produced materials the world is now suffering from serious energy and environmental challenges. Today's buildings made with industrial materials are wholly- solely responsible for the consumption of minimum of 40% of total energy and about 3/4th of the total greenhouse gases is emitted by them. [3]. This energy consumption will be throughout the life of the building so it's important that our buildings consume as less as possible and their emissions should also be least. This drop in energy consumption can be best done by using locally available materials following the footsteps of vernacular architecture which will drop down the carbon foot print as well as the waste production during the construction and demolition of the building.

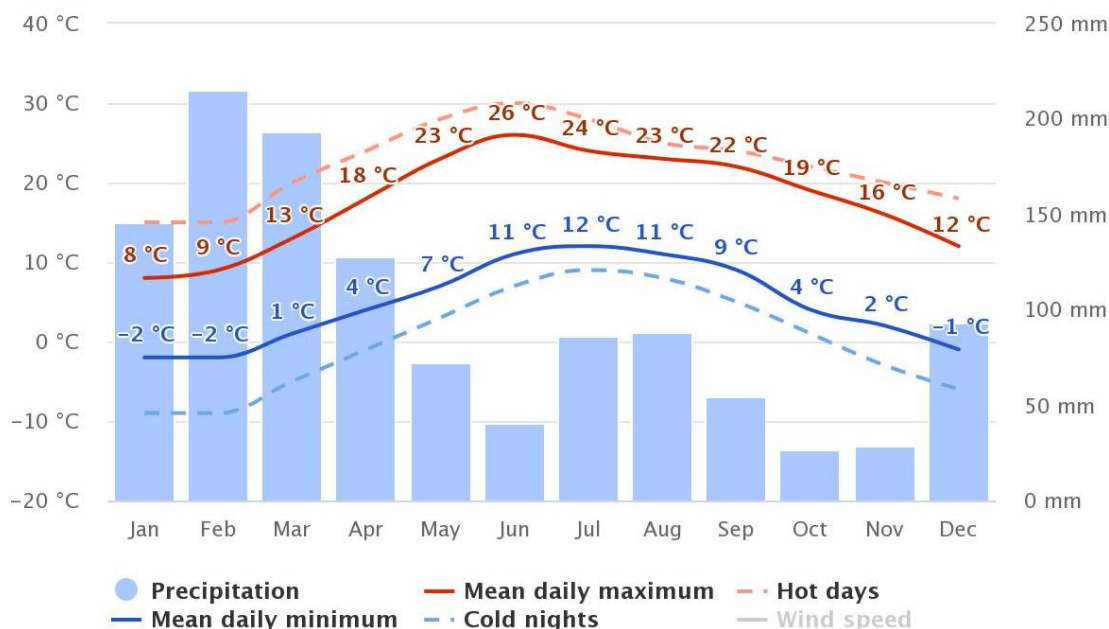
2. Vernacular architecture: Vernacular architecture is a type of architecture where local or regional construction is preferred using traditional materials and resources from the same region itself. Due to this, they are unique in themselves and are different in different places of the world, becoming even a means of reaffirming an identity. Vernacular architecture is depicted by a type of a traditional expression, which is modified keeping in mind the response to various factors like - geographic, climatic and economic - characterizing the local area or region [2] According to Fernandes et al. [2], vernacular architecture is the one of the way to express the culture of a group of people and help them to define their zones along with the change in culture and environmental constraints. The term vernacular stems from the Latin word ‘vernaculus’ and which means something domestic, native or indigenous. This style of architecture came into existence when man was looking for shelter to save themselves and they found locally available materials useful. Vernacular architecture follows the concept of basic green architectural principles to have best energy efficient materials and resources in the closest proximity to the site.

2.1 Factors affecting vernacular architecture/materials:

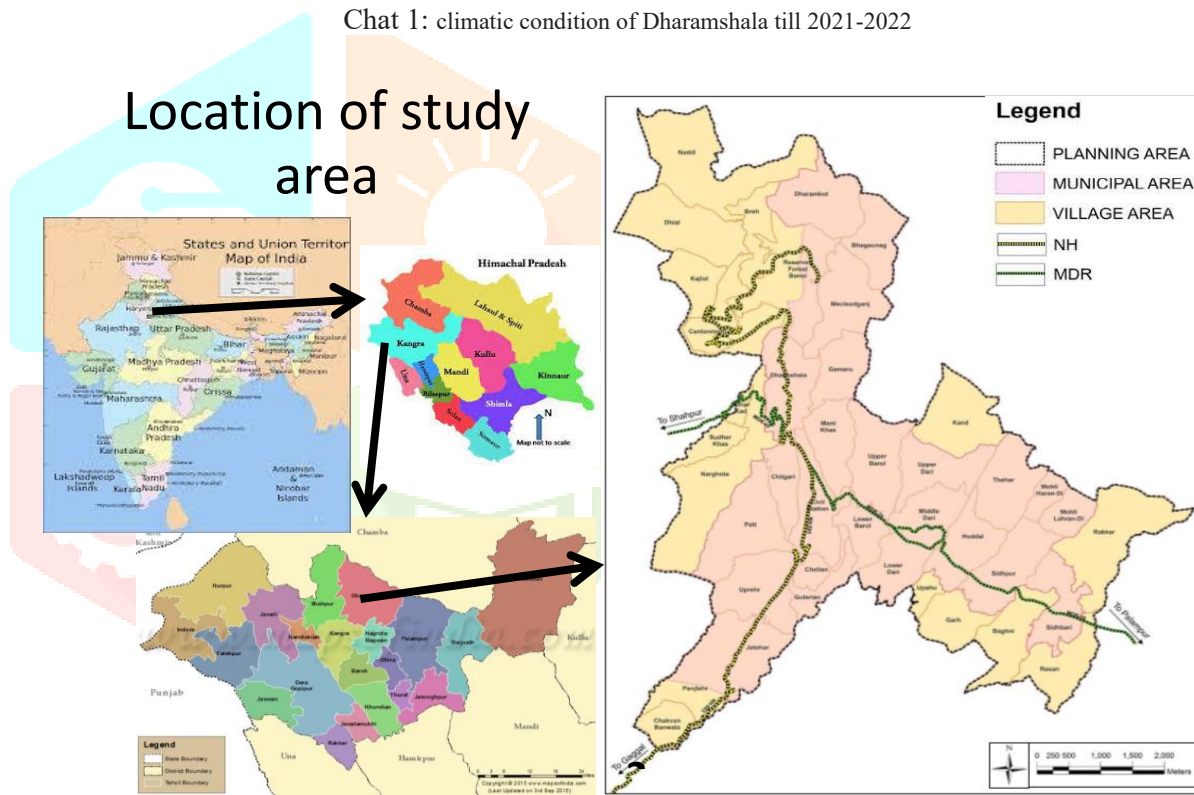
Geographical factors:

- 2.1.1 *Climate:* In every new region with change in season the material should respond to compensate the harshness of it. Slanting roof and construct dwelling on stilts in areas with high level of rainfall. Orientation of buildings such that they have minimal area to the direction of prevailing winds.
- 2.1.2 *Location* The natural physical environment, The type of topography, soil type
- 2.1.3 *Size of family unit:* Our life styles always reflected on our town development. Joint family or nuclear family? How do people interact? Local customs and beliefs are supported by the materials and vernacular technology.
- 2.1.4 *Materials:* Availability of specific materials will increase or decrease its usage for construction, e.g. large amount of forest will increase the preference of wood for construction purposes. And mud/stone otherwise. Material used will depend upon the physical condition of that area. The area prone to earthquake would have different architecture than the one with floods. Vernacular is sustainable and doesn't exhaust local resources. Only those resources are used which are found in abundance and are non-exhaustive

3. Dharamshala-The study area: Dharamshala (winter capital) in Himachal Pradesh situated in the lap of Himalayas (figure1) and has an average elevation of 1457 meters [6]. Dharamshala is a town in the Kangra Valley, within the Dhauladhar mountains. Dharamshala has a humid climate which is monsoon influenced. Dharamshala also experiences rain up to 3,000 mm (120 inches), thereby making it one of the wettest places in the state. Also snow and sleet are common during the winter in upper Dharamshala.



Chat 1: climatic condition of Dharamshala till 2021-2022



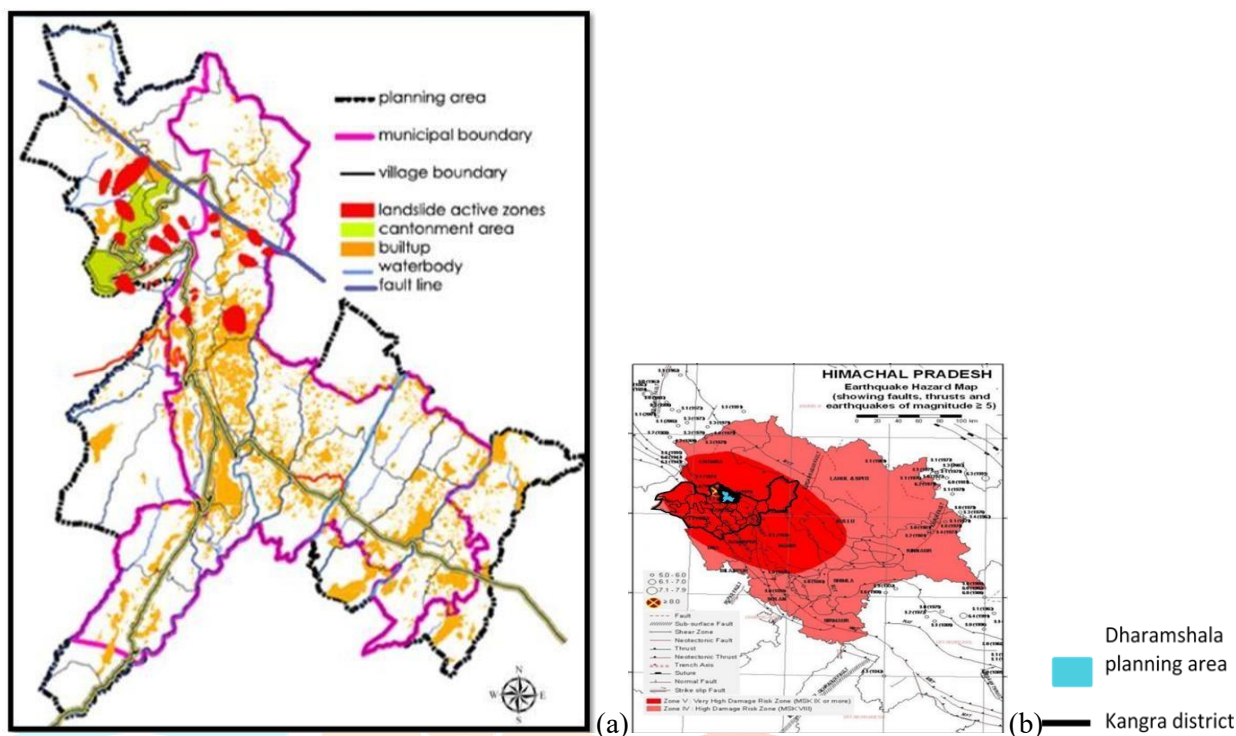
Map1: location of Dharamshala (source: Master Development Plan Dharamshala, TCPO-HP, 2035)

3.1 Geo-environmental perspective of Dharamshala:

Dharamshala falls in the Seismic Zone V according to the map2(b). Fragile lithology and overlying deposits is a call for landslide (78% of sandstone base with debris soil). Today’s development is ignoring the sensitivity of basement rocks and the steep slope morphology. Such human activities are increasing the landslide problems. Being situated in the laps of young Himalayan range which are continuously growing and also having a fault line underneath map2(a)-Dhauladhar which is highly prone to disasters like earthquakes, floods and landslides the resistivity of town towards the disasters become low. Dharamshala has few active landslide zones as well as one fault like passing under its major hot spots like Naddi and MacLeod Ganj.

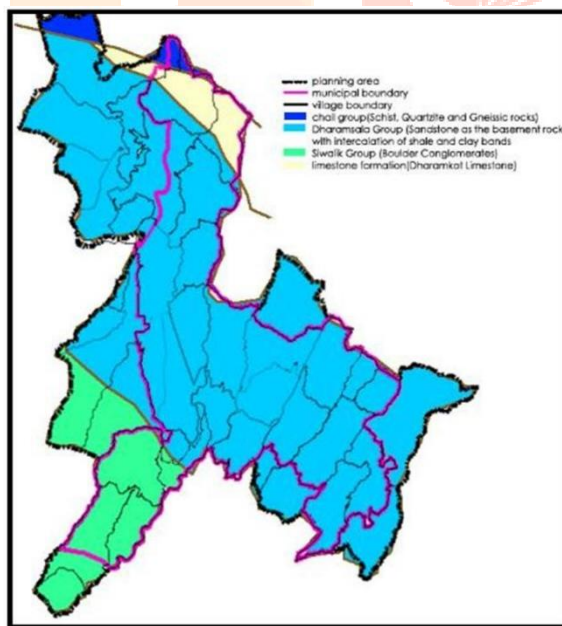
For lithology the Dharamshala group having sandstone as basement and intercalation of shale and clay bands is covering almost 80%of the area shown in map-2 which is fragile in holding any heavy development there by increasing its risk. Heavy moisture in this soil or loosening of the soil can cause destruction in this case. The soil of Dharamshala is also mostly debris (map-3) which is generally found to be loose therefore tendency to slip in heavy monsoons also

get high. Most of the planning area is covered by young debris of clay and sandstones which is loosely packed and can easily slip off during heavy rains. This type of top soil also becomes looser if excavated specially on steep slopes.



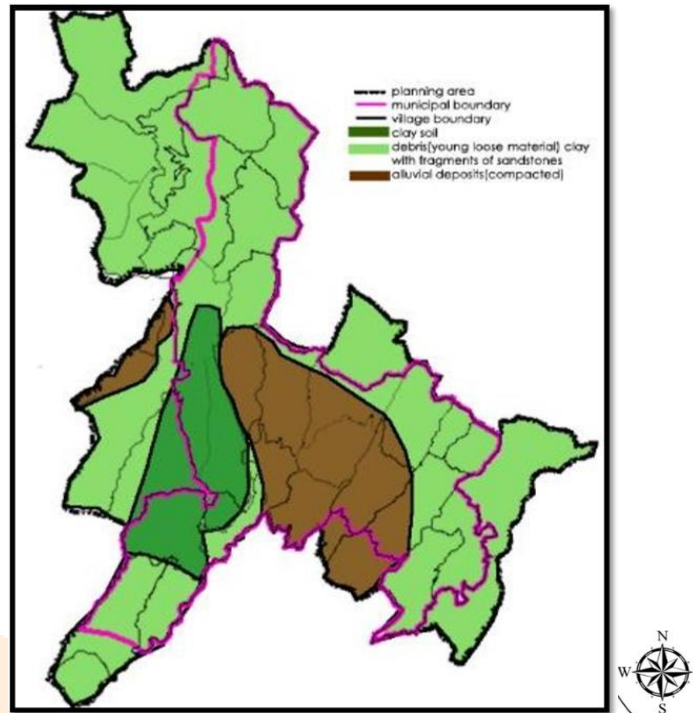
Map2: showing the fault line and active landslide zones.

Source: Himachal Pradesh state disaster management authority, earthquake hazard risk assessment report-1



Map 3: Geological map of Dharamshala planning area showing its lithology

source:- ground water information booklet kangra distt, H.P.2013, CGWB, ministry of water resources, H.P.



Map-4: Soil map of Dharamshala planning area

source:- ground water information booklet kangra distt, H.P.2013, CGWB, ministry of water resources, H.P.

3.3 Today's scenario:

Currently in Dharamshala the development that is seen is not totally towards modern type of construction where the vernacular materials as well as construction techniques have been replaced by the modern ones. The scenario of this hill town is no more like a hill in-fact changing towards a concrete forest as shown in the picture below. Rapid urbanization in the area increases the pressure on the soil, sub surface and underground layers which may trigger earthquake and landslide in the area and cause severe damage.

There is a specified floor area ratio kept for the development of the town i.e. 1.75. But unfortunately, none of the hotels in the core area of McLeod Ganj (one of the famous part of Dharamshala) falls in the list of obeying this bye law and qualifies to have more than four stories. In fact many 6-7 storied hotels and commercial buildings have been brought up in the core area. This is ultimately increasing the pressure over the fault line below and putting the life of many at risk. McLeod Ganj was brought down to ashes when felt an earthquake tremor in 1905 of 7.5 magnitude. And if this happens again then even a small magnitude tremor will be able to cause large destructions. Currently it has 50 hotels which can accommodate 3000 guests at min to 4500 guests a night.

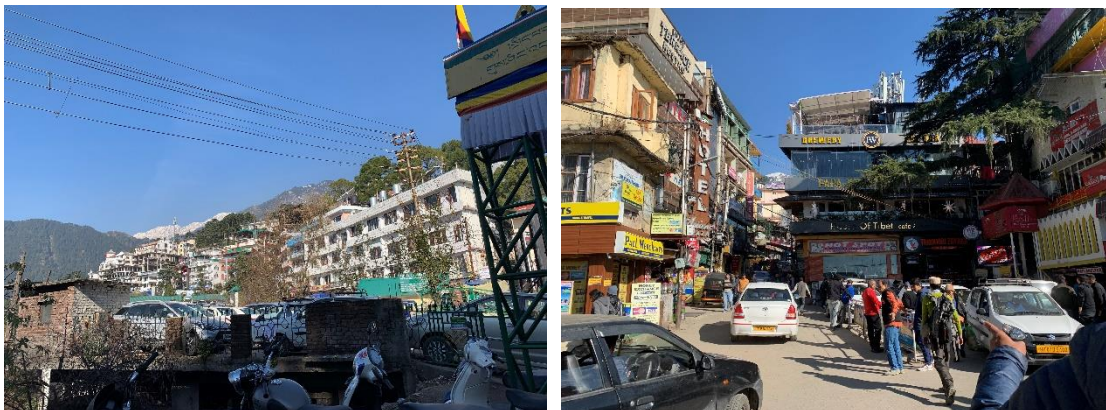




Fig1 : current development in dharamshala town.

3.4 Need of Vernacular of Dharamshala looks like:

As the densely growing unplanned development reducing the resistance of the town to survive after the occurrence of any natural disaster and making the town more prone to disasters. It has become very important for us to realise the need of vernacular architecture and importance of locally available materials like stone, mud, slate and bamboo, etc. Vernacular architecture being material specific reduces the carbon foot print therefore no doubt it is environment friendly with least waste generation. It can help in lowering the level of destruction if the town get hit by natural or manmade disaster in coming future. Vernacular techniques of construction increase the resistivity of the town and hence can balance it's carrying capacity with respect to its geological conditions and limitations. Vernacular materials when used with the vernacular techniques of construction add sustainability to the town and make it possible for coming generations to enjoy the traditional way of living with their specific society.



Fig2 : images showing various vernacular material used for construction in villages of dharamshala making development with least impact on environment.

3.4.1 Why only vernacular?

Vernacular architecture has height limitations, one cannot go beyond one specific height and so put less load on earth also need very less excavation for its foundation. This will reduce the human penetration within the earth and won't disturb the tectonic plates beneath.

Vernacular architecture is material specific. Only the local materials are vernacular materials, which by nature itself fit the best to withstand the natural geological and climatic conditions of the specific area. Materials like mud, bamboo, timber, slates and stones are commonly found in Dharamshala and nearby areas for constructing traditional vernacular buildings. Vernacular materials specifically and the construction techniques related to it can lower down the impact of any destruction and thereby loss of life can be reduced making the building energy.

4. Conclusion: Dharamshala being situated on an active fault line is highly prone to earthquakes and landslides. The fast and unplanned development in the town is proving to be harmful to the nature and triggering the fault line along with landslide zones. Going deep for excavations and erecting tall buildings are leading to the loosening of the soil in areas around the building. The top soil of Dharamshala which is already debris as per the CGWB report of water resource, H.P. and extra excavation makes it more loose. This is deteriorating the stability of the soil on the hills and make them to move under the act of gravity causing a landslide. As the town faces huge rainfall so the tendency of landslides of the loose soil increases in the monsoon seasons.

To resolve this deteriorating condition of any hill town, following solutions can be put forward. Valuing the contours system of hill stations can be helpful in reducing the excavations and triggering the landslide zones or the tectonic plates below. The illegal encroachments within the town needs to be resolved to have a healthier development in hill towns keeping the variation in topography, slope drainage pattern valued.

Vernacular architecture like dhajji, commonly found in Dharamshala is earthquake resistant and lower down the impact of earthquake by reducing the loss of life. Vernacular construction techniques are having limits like limit of heights and need some local professional artisans, but this limit actually help the local economy to grow, makes the town self sufficient and also reduced the dead load on the patch of land. This height restriction brings down the level of destructions during any disastrous event.

Sustainability is the need of the hour and hill towns like Dharamshala facing huge pressure especially due to increasing tourism activities and migrants. Therefore, making the development go sustainable will reduce the pressure over the city to large extent. Vernacularism in hilly regions always followed the rule of low footprint thereby keeping more open space around the house for various activities but today the modern buildings have rule of high footprint, high built to open ratio which has reduced the %age of open spaces in hill towns. Planners can follow this rule of vernacularism and can help in adding more open space by landscaping the spaces between the buildings and also by lowering down the %age of built up within a plot.

Vernacular architecture will make the city resistive and sustainable. The locally available materials are always renewable, easily workable, have good climatic and seismic response. Adopting the already available local building materials with new construction technologies can help us in making the development of a town climatic responsive. This will lower consumption of energy and reduce the degradation of our habitable environment. This change can be brought by imposing such rules and regulation which supports the nature and make the development long lasting. Region specific Vernacular practices with suitable modifications, as per the change in life styles and climate of the area, can be taken into consideration for the purpose of design and construction to have disaster resistant structures within a hill region. To meet the demands of people with change in life styles architecture must see that the adoption of traditional built forms, their patterns and various facade elements (improving aesthetic quality along with structural quality of new upcoming buildings in hilly areas) should not be neglected in the present scenario of development. So wisely opting for vernacular development can be one of the options in laying the foundation of all the hill towns to go long.

As architects and planners, one must understand the essence of the hill town and allocate the land use with strict regulations to make the development with lesser risk of destruction in any disastrous situation.

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